Greenhouse Gas (GHG) Emissions, Forecasts and Targets

The reduction of greenhouse gas (GHG) emissions is one of the primary objectives of the Long Beach CAAP. Developing meaningful reduction strategies and evaluating their ability to meet a GHG target first requires an understanding of the community's base year and projected future emissions levels. This chapter describes the sources and scale of emissions generated by activities within Long Beach using a baseline year of 2015 to reflect current conditions, and how they are estimated to grow through 2050. It also describes the City's emissions reduction target for 2030 and aspirational GHG goal for 2045 to demonstrate the amount of reductions needed in each target year from implementation of local actions.

To provide a robust understanding of its GHG profile, the City analyzed emissions through three different lenses. The primary emissions analysis was through development of a production-based inventory that represents emissions occurring from local activities, like vehicle travel, home energy use, and waste disposal. The production-based inventory is the foundation for the city's emissions forecasts and target setting, and is the inventory against which CAAP implementation will be measured, as is typical for a CAAP. The City also developed a high-level consumption-based inventory to better understand the upstream emissions that occur as a result of residents' travel and consumption of energy, water, goods, and services. This analysis primarily focuses on households and takes into account the emissions embedded in the food residents eat, the products they purchase, and the fuels they use. It also accounts for some City operations. Finally, the City analyzed the lifecycle emissions associated with oil and gas extraction activities in Long Beach. This analysis estimates the total emissions that occur globally as a result of local fossil fuel production. Each inventory analyzes the community's emissions in a different way, and so cannot be summed into one comprehensive emissions total. Although the production-based BASIC inventory is used for the CAAP, as is standard practice and per the Global Covenant of Mayors protocol, the results of each inventory were informative and used to define the CAAP's specific actions.

The emissions results presented in this chapter are expressed as metric tons of carbon dioxide equivalent per year (MT CO_2e/yr) to provide a standard measurement that incorporates the varying global warming potentials (GWP) of different greenhouse gases. GWP describes how much heat a greenhouse gas can trap in the atmosphere relative to carbon dioxide, which has a GWP of 1. For example, methane has a GWP of 28, which means that 1 metric ton of methane will trap 28 times more heat than 1 metric ton of carbon dioxide, making it a more potent greenhouse gas.

2015 Production-based Inventory

Long Beach's community emissions inventory follows the guidance provided in the Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC). The GPC is a globally-accepted framework to consistently calculate and report community GHG emissions. It is also the standard used by the Global Covenant of Mayors, the world's largest cooperative effort among mayors and city officials to reduce global GHG emissions, track progress, and prepare for the impacts of climate change; the City of Long Beach joined the Global Covenant of Mayors in 2015. Therefore, this inventory is used as the basis for the Long Beach CAAP.

The GPC requires cities to report their emissions by greenhouse gas, sector/subsector, and scope. The scopes framework helps to differentiate emissions occurring physically within the city (Scope 1) from those occurring outside the city (Scope 3), and from the use of energy supplied by grids (e.g., electricity) that may cross city boundaries (Scope 2).

The GPC also provides two levels of reporting with regard to the sources of emissions analyzed, referred to as BASIC and BASIC+. Table 1 presents the three emissions scopes analyzed in the GPC framework, along with the BASIC inventory reporting requirements. Long Beach developed a production inventory that achieves the BASIC reporting requirements, and allows the city to compare its emissions to other cities that follow the GPC methodology.

Table 1: GPC Protocol Scope Definitions for City Inventories

Scope	Definition	BASIC Requirement
Scope 1	GHG emissions from sources located within the city boundary	Fuel use in buildings, transport, and industry; Waste generated within the city's boundary
Scope 2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary	Use of grid-supplied energy
Scope 3	All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary	Waste (including wastewater) generated within the city's boundary

Source: Global Protocol for Community Scale Greenhouse Gas Emission Inventories

BASIC+ reporting requires more comprehensive coverage of emissions sources, including some sources over which a city has limited control to reduce emissions. During preparation of the Long Beach BASIC inventory, data was collected for several of these additional BASIC+ emissions sources and analyzed separately from the city's BASIC level inventory to provide additional emissions perspective. One example would be emissions from airplanes landing at Long Beach Airport, which are federally regulated and over which the City has limited control. In the BASIC inventory, those airplane emissions are not included, but emissions associated with airport operations that are in the City's control, such are ground transport, are included. However, one of the primary purposes of a community emissions inventory is to inform city climate change policy development, and the CAAP was designed to focus on opportunities for action that

are within the City's and community's control. Therefore, for purposes of GHG analysis in the CAAP, the BASIC level inventory was used to develop emission forecasts and evaluate GHG targets.

Emission Sectors

The production inventory is organized into three emissions categories, or sectors, based on their sources:

- **Stationary Energy**: Emissions from building electricity and natural gas use in residential, commercial, institutional, and industrial buildings, as well as emissions from energy industries operating within the city limits.
- **Transportation**: Emissions associated with passenger vehicles, buses, trucks, rail transit, freight rail, off-road vehicles, marine vessels, and aviation operations within the city limits.
- **Waste**: Emissions from waste disposed in landfills or incinerated, as well as emissions from wastewater treatment.

Production Inventory Results

Table 2 on the following page presents the city's 2015 production inventory. The table includes results from the BASIC inventory, which is the inventory upon which the CAAP is based. It also includes the additional BASIC+ analysis, which is being provided for informational purposes. The city's BASIC emissions totaled 3,100,468 MT CO_2e/yr in 2015. This equates to 6.6 MT CO_2e per Long Beach resident in 2015 (MT CO_2e/capita). Transportation was the largest emissions source in the inventory, with stationary energy use contributing most of the remainder. Transportation and energy emissions account for nearly 95% of the inventory, which indicates that local reduction efforts should focus on these areas to maximize impact toward the GHG targets. The waste sector emissions make up the remainder.

The BASIC+ emissions sources analyzed for 2015 totaled 3,366,173 MT CO_2e/yr (or 7.2 MT CO_2e/capita), and reflect the BASIC inventory emissions with the addition of transboundary aviation and waterborne travel emissions.

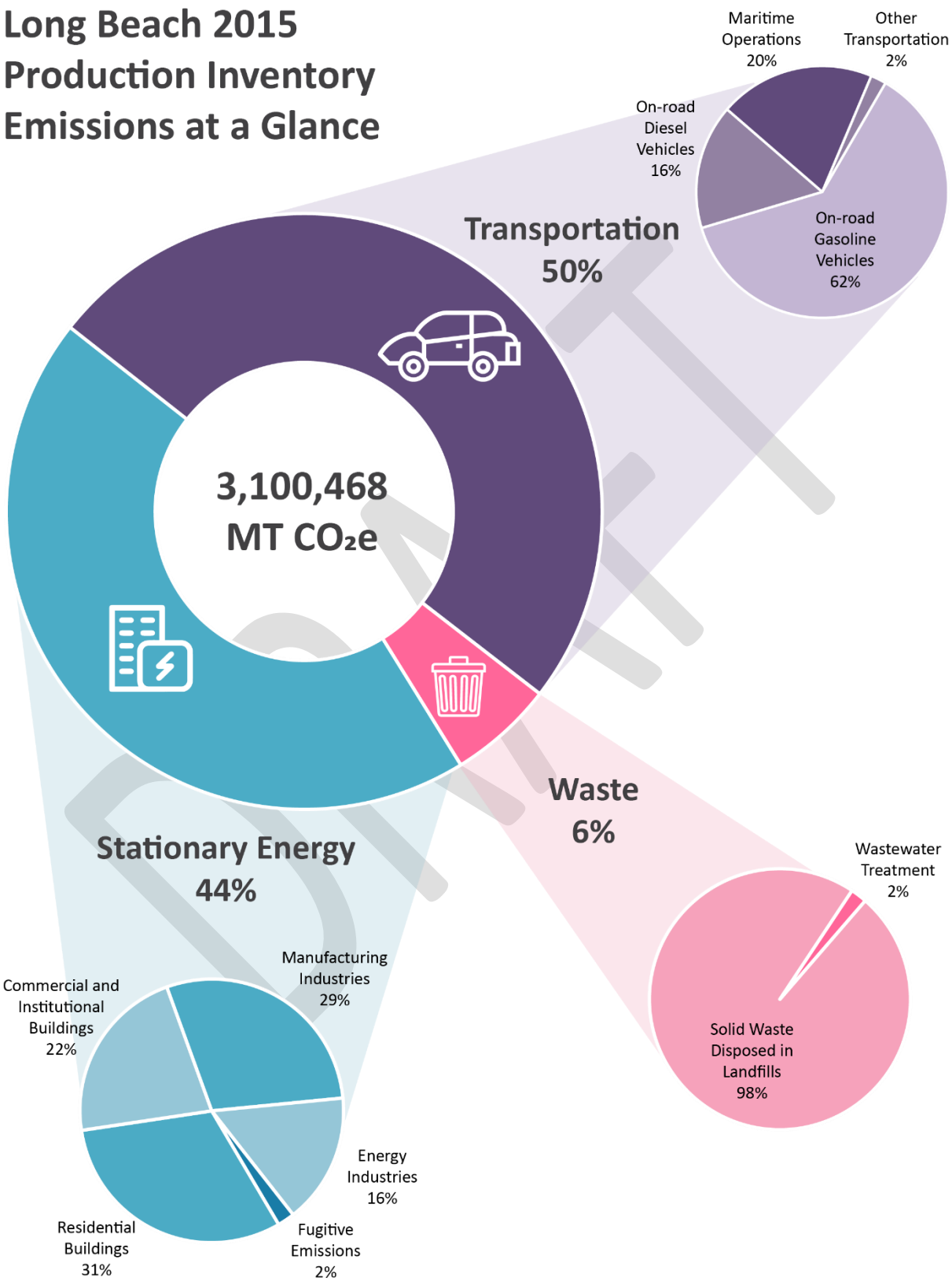
Table 2: Production Emissions Inventory by Subsector

Sector/Subsector	2015 Emissions – BASIC *(inventory used in CAAP analysis)*		2015 Emissions - BASIC+[1]	
	MT CO_2e	% of BASIC Total	MT CO_2e	% of BASIC+ Total
Stationary Energy	**1,377,291**	**44.4%**	**1,377,291**	**40.9%**
Residential Energy	428,245	13.8%	428,245	12.8%
Natural Gas	*241,176*	*7.8%*	*241,176*	*7.2%*
Electricity	*187,070*	*6.0%*	*187,070*	*5.6%*
Commercial and Institutional Buildings Energy	300,818	9.7%	300,818	9.0%
Natural Gas	*109,593*	*3.5%*	*109,593*	*3.3%*
Electricity	*191,225*	*6.2%*	*191,225*	*5.7%*
Manufacturing Industries and Construction Energy	399,089	12.9%	399,089	11.8%
Natural Gas	*74,853*	*2.4%*	*74,853*	*2.2%*
Electricity	*324,235*	*10.5%*	*324,235*	*9.6%*
Energy Industries	219,899	7.1%	219,899	6.5%
Fugitive Emissions from Natural Gas	29,240	0.9%	29,240	0.9%
Transportation	**1,546,326**	**49.9%**	**1,812,031**	**53.8%**
On-Road Transportation	1,213,601	39.1%	1,213,601	36.1%
Gasoline Vehicles	*960,661*	*31.0%*	*960,661*	*28.5%*
Diesel Vehicles	*252,940*	*8.2%*	*252,940*	*7.5%*
Railways	11,883	0.4%	11,883	0.4%
Aviation	4,550	0.1%	186,738	5.5%
Maritime	301,345	9.7%	384,862	11.4%
Off-Road Equipment	14,947	0.5%	14,947	0.4%
Waste	**176,850**	**5.7%**	**176,850**	**5.3%**
Solid Waste Methane Commitment	173,164	5.6%	173,164	5.1%
Solid Waste Incineration	95	0.0%	95	0.0%
Wastewater Treatment and Discharge	3,592	0.1%	3,592	0.1%
TOTAL	**3,100,468**	**100%**	**3,366,173**	**100%**
Per Capita	6.6	-	7.2	-

[1] Per the GPC community inventory protocol, a complete BASIC+ inventory includes calculation of several additional emissions sources beyond those in the BASIC inventory. Long Beach has additionally calculated the BASIC+ emissions from transboundary journeys in the aviation and waterborne navigation sub-sectors because the supporting data was collected with data for the BASIC calculations. This column does not reflect a complete BASIC+ inventory, but does provide emissions information beyond the scope of the BASIC inventory.

Figure 1 on the following page illustrates the city's 2015 production inventory results by sector and sub-sector.

Figure 1: Long Beach Production-based Inventory Emissions Summary



2015 Consumption Inventory

A consumption-based inventory attempts to account for emissions inside and outside a community that occur from consumptive activities in the community. The City's consumption inventory was prepared based on guidance in the ICLEI U.S. Community Protocol and input from City staff. The Community Protocol describes a consumption inventory methodology that is applied at the household level to estimate a household carbon footprint. In other words, how much carbon is generated in the production and use of goods and services by households in Long Beach? The inventory analysis represents a high-level estimate based on average household emissions factors for the City of Long Beach provided in the California Air Resources Board's Cool California household carbon calculator. Based on this methodology, the inventory primarily represents emissions from the sum of all household consumption in the city, with local government emissions also included where data was available from the City's 2015 Local Government Operations inventory. Local businesses and industries are not directly included in the consumption inventory because emissions from the goods and services they produce are represented as household emissions from the consumption of goods and services.

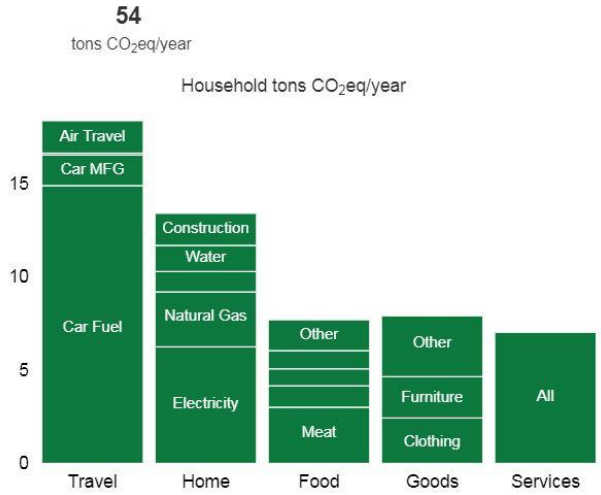
As with the production inventory, the consumption inventory is organized into categories of emissions sources. Cool California organizes emissions into travel, home, food, goods, and services. For purposes of comparison against the city's production inventory, the consumption inventory results are reported here as:

- **Energy**: Emissions associated with household and government operations energy use, including the production and distribution of energy sources to buildings, as well as energy used to provide water and to construct buildings.
- **Transportation**: Emissions associated with fuel use in household vehicles and the City vehicle fleet, public transit, and air travel; the production and distribution of vehicle fuels; and the manufacture of cars.
- **Goods and Services**: Emissions associated with all household goods and services consumption, including from the production and distribution of food, the extraction of raw materials for and the production of goods (e.g., clothing, furniture), and emissions associated with businesses providing services to residents of Long Beach.

Figure 2 on the following page shows an example of the average household emissions outputs provided in Cool California. In addition to the subsector labels shown, the travel sector includes emissions from public transit; the home sector includes an 'other' emissions category; and the food sector includes emissions from dairy, fruits & vegetables, and cereals.

In developing the consumption inventory, city-specific data was used where possible to further contextualize the analysis to Long Beach. For example, community vehicle travel data collected for the production inventory was used instead of default car fuel assumptions that are built into Cool California. Similar changes were made for the electricity, natural gas, and waste subsectors.

Figure 2 – Long Beach Average Household Carbon Footprint



Source: CoolCalifornia.org, 2019

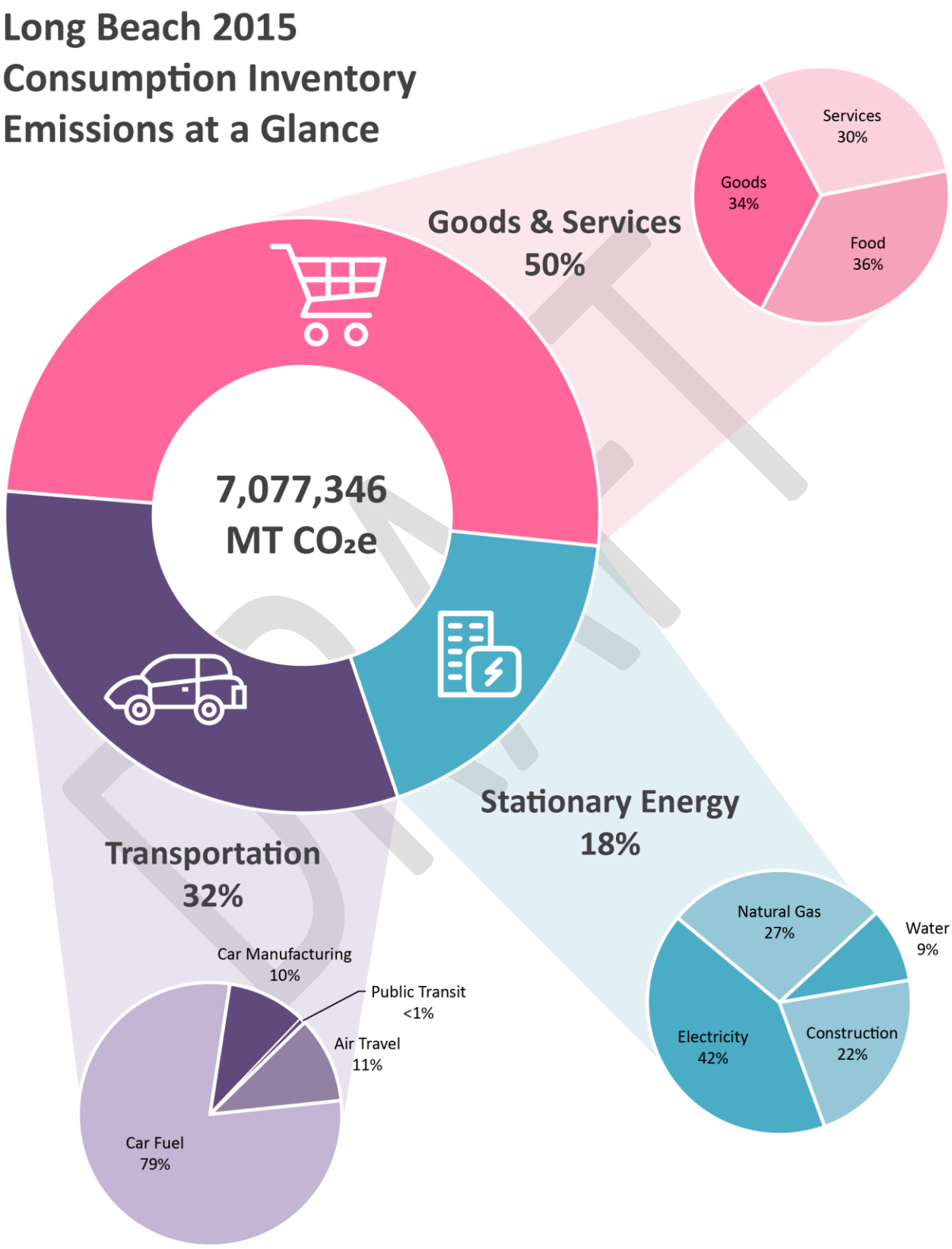
Consumption Inventory Results

The city's consumption emissions inventory totaled 7,077,346 MT CO_2e/yr in 2015, more than double the BASIC production inventory. As shown in Table 3, goods and services are the largest contributor of emissions in the community, followed by transportation, and then energy. Consumption emissions total 15.1 MT CO_2e/capita. Figure 3 illustrates the emissions by sector and sub-sector.

Table 3: Consumption Emissions Inventory by Subsector

Sector	2015 Emissions	
	MT CO_2e	% of Total
Energy	**1,284,173**	**18%**
Electricity	534,063	8%
Natural Gas	348,138	5%
Water	117,371	2%
Construction	284,600	4%
Transportation	**2,230,704**	**32%**
Vehicle Fuel	1,764,092	25%
Car Manufacturing	216,760	3%
Public Transit	13,237	<1%
Air Travel	236,615	3%
Goods and Services	**3,562,469**	**50%**
Food	1,272,429	18%
Goods	1,229,408	17%
Services	1,060,633	15%
TOTAL	**7,077,346**	**100%**
Per Capita	15.1	-

Figure 3: Long Beach Consumption Inventory Emissions Summary



Comparison of Production and Consumption Inventories

The community to which emissions from goods consumed is attributed highlights the primary difference between a production and consumption inventory. In a production-based inventory, a city with a large manufacturing industry producing goods would account for the energy used during production, even if the goods are exported for use elsewhere. In a consumption-based inventory, the city in which the consumers of goods live would account for those emissions, even if the goods consumed in the community were imported from elsewhere. The current industry standard in climate action planning is to evaluate a community's production-based inventory because they reflect emissions over which local governments have more direct control and because the supporting quantification methodologies and reporting frameworks are more fully developed at this time. However, there is a growing consensus about the importance of consumption inventory analysis to complement production inventories in helping community's more fully understand their contributions to global emissions.

Table 4 shows the results of the city's 2015 production and consumption inventories. The inventories are organized into three sectors for comparative purposes, although these sectors do not support a direct apples-to-apples comparison. As shown, the consumption inventory is nearly 2.3 times larger than the production inventory. The primary difference in the two is in the waste / goods and services sector. Waste emissions in the production inventory represent end-of-use emissions when goods are disposed in a landfill or incinerator. Goods and services emissions in the consumption inventory reflect the complete lifecycle of goods, including emissions from upstream production (e.g., raw material extraction, manufacturing, shipping) as well as downstream disposal.

Table 4: Production vs. Consumption Inventory Emissions by Sector

Sector	2015 Emissions			
	Production (MT CO_2e)	Production (%)	Consumption (MT CO_2e)	Consumption (%)
Stationary Energy[1]	1,377,291	44%	1,284,173	18%
Transportation	1,546,326	50%	2,230,704	32%
Waste / Goods and Services[2]	176,850	6%	3,562,469	50%
TOTAL	**3,100,468**	**100%**	**7,077,346**	**100%**
Per Capita	6.6	-	15.1	-

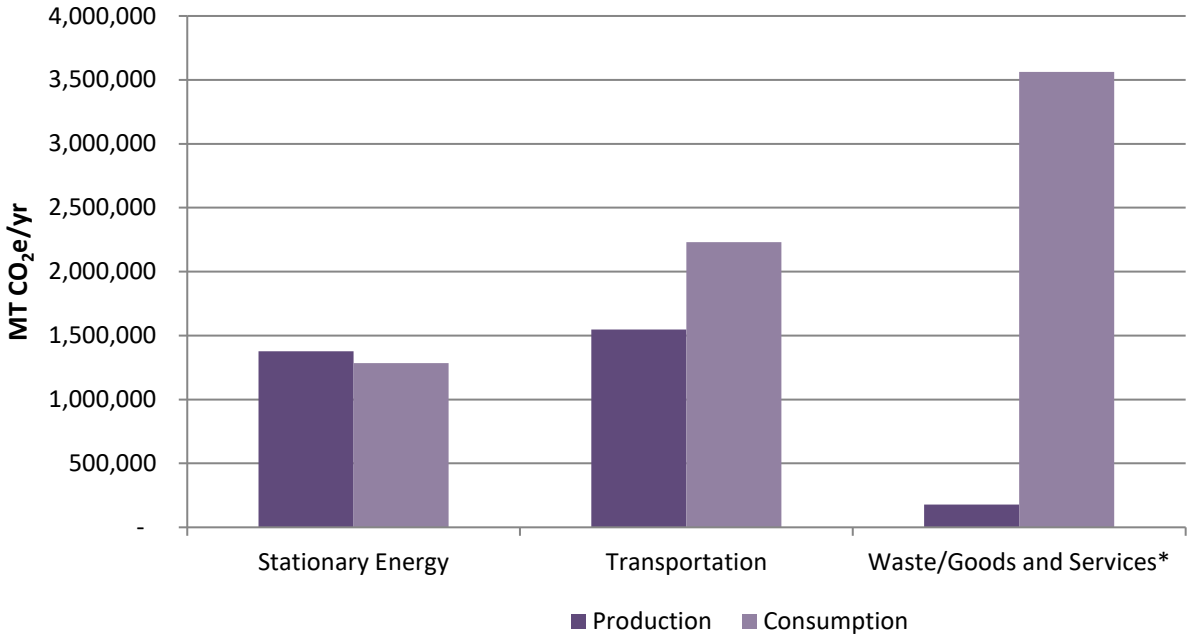
[1] Energy emissions in the production inventory include energy use from residential, commercial & local government, and industrial sub-sectors. The consumption inventory only includes household and local government energy use, which results in lower total energy emissions.

[2] These sectors from the production and consumption inventories are not directly compatible, but are closely related as they represent emissions associated with the consumption and disposal of goods.

Based on the results of this emissions comparison, the greatest opportunities to reduce consumption emissions are to pursue low-emissions diets (e.g., reduced meat and dairy consumption, which contribute 39% and 15% of food emissions, respectively), minimize purchases of goods and services, and increase

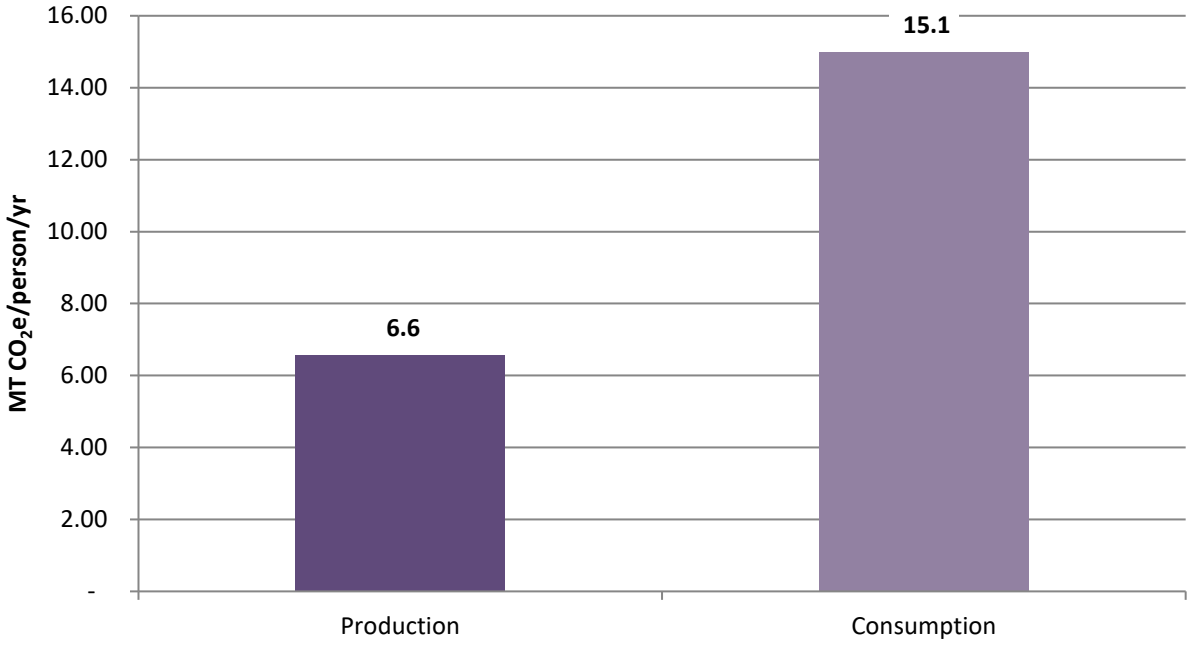
the use of pre-owned goods or the purchase of products that minimize packaging and/or are produced locally. Figures 4 and 5 on the following page illustrate the production and consumption inventory results.

Figure 4: Production vs. Consumption Inventories – Total Emissions



** These sectors from the production and consumption inventories are not directly compatible, but are closely related as they represent emissions associated with the consumption and disposal of goods.*

Figure 5: Production vs. Consumption Inventory – Per Capita Emissions



Oil and Gas Lifecycle Emissions Analysis Results

As its third type of emissions analysis, the City analyzed the lifecycle emissions associated with oil and gas extraction operations occurring within the city boundary. This analysis supports a more holistic view of the City's total contribution to global emissions, and complements the production and consumption inventories. The analysis is summarized below. Additional detail, including data sources, methods, and detailed analysis, can be found in Appendix XX City of Long Beach Oil and Gas Memo.

In 2015, oil fields in the city produced more than 13 million barrels of crude oil and 5 billion cubic feet of natural gas. The resulting lifecycle emissions total 8.3 million MT CO_2e, which is 2.7 times greater than the city's production inventory emissions. The lifecycle emissions represent different phases of the oil supply chain, including upstream extraction activities at the city's oil fields, midstream refining activity occurring outside of the city, and downstream end use of the fuels produced like vehicle gasoline and diesel, which can be consumed inside and outside of the city. The lifecycle emissions were estimated using an upstream emissions factor specific to the Long Beach oil field developed by the California Air Resources Board (CARB), and midstream and downstream emissions factors for the nearby Wilmington oil field collected from the Oil-Climate Index.

Approximately 96% of the city's oil and gas lifecycle emissions are attributed to crude oil, with the remaining 4% resulting from natural gas. The analysis estimated that all of the natural gas extracted in Long Beach is consumed in the community, and that all of the oil extracted in Long Beach is consumed within California. Of the total lifecycle emissions, 76% occur downstream (i.e., transport to consumers and end use of fuel), 14% occur midstream (i.e., oil refining), and 5% occur upstream (i.e., extraction); the remaining 4% are lifecycle natural gas emissions.

Understanding the lifecycle emissions sources helps to identify the City's opportunities for intervention. Upstream emissions occur at the oil fields within the city boundary, where the City issues well permits for petroleum operations. Opportunities to reduce these emissions could include energy efficiency improvements in the extraction process or increased leak monitoring and detection. Oil extracted in Long Beach is refined into various end products, which are consumed inside and outside the city. Through this CAAP, the City is pursuing actions that would reduce local consumption of fossil fuels from building energy efficiency improvements, reduced vehicular travel, and expansion of electric vehicle technology. However, the City's ability to influence use of Long Beach oil products outside of the city is limited. Similarly, the oil refining process occurs outside the City's jurisdiction, where its ability to influence these midstream emissions is also limited.

The City's long-term strategy to address oil and gas lifecycle emissions will need to be multi-pronged and collaborative, including local action to replace fossil fuel consumption in Long Beach with clean electricity and other renewable energy sources, supporting efforts to minimize global demand for the types of oil and gas resources extracted in the city leading to a reduction in local oil and gas extraction, and investments in future carbon capture technology. In the long term, to maximize carbon emission reductions, the City must explore ways to decrease and eventually phase-out local oil and gas extraction.

Emission Forecasts

The BASIC production inventory was used to develop communitywide emissions forecasts for the 2030, 2040, and 2050 planning time frames. These "business-as-usual" forecasts estimate how emissions could change in the future if no local action is taken, such as through CAAP implementation. Emissions forecasts can provide useful insight about the scale of reductions necessary to achieve the City's emissions targets, and represent a best estimate of the future for the purposes of CAAP development.

Emissions were forecast using a variety of factors that represent the drivers of emissions growth in the community, such as local population and employment, travel demand modeling, and shipping activity at the Port of Long Beach. The forecasts also take into account the implementation of several important components of the State's GHG reduction strategy, including the Renewables Portfolio Standard Program, a state law that requires increasing amounts of renewable electricity in California and various vehicle efficiency standards that will reduce emissions from on-road transportation to ehlp achieve California's 2030 GHG targets.

Figure 6 illustrates the City's emissions forecasts by sector through 2050. Emissions are estimated to increase in the near-term before decreasing through 2050. The forecast decline is largely a result of statewide actions influencing the City's electricity emissions and an estimated decrease in natural gas use in the energy sector. Vehicle efficiency improvements that reduce on-road transportation emissions serve to partially offset emissions growth in other transportation sub-sectors. All other emissions sources are forecast to experience growth from 2015 to 2050.

Figure 6 – Emissions Forecasts 2015 - 2050

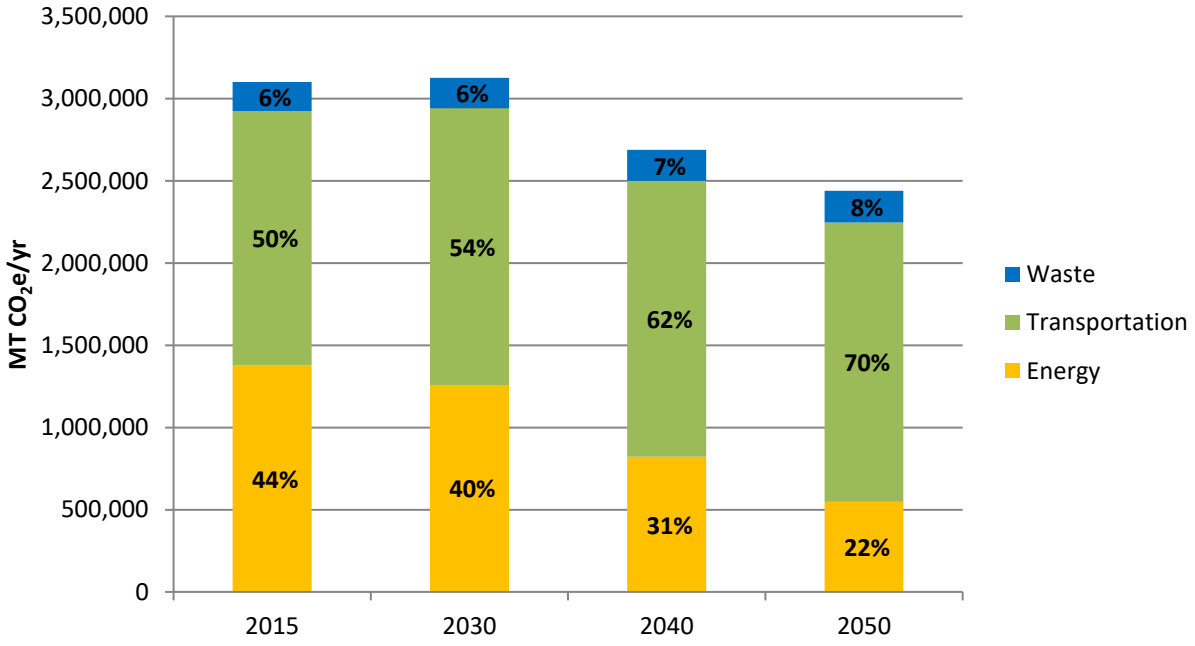


Table 5 on the following page shows the emissions forecasts by sector and sub-sector in 2015, 2030, 2040, and 2050. Per capita emissions are estimated to decrease over this period from 6.6 MT CO_2e/capita to 5.0 MT CO_2e/capita.

Table 5: Community Greenhouse Gas Emissions Forecasts 2015 - 2050

Sector	Emissions (MT CO_2e)			
	2015	2030	2040	2050
Stationary Energy	**1,377,291**	**1,260,759**	**822,779**	**547,747**
Stationary Energy % of Total	**44%**	**40%**	**31%**	**22%**
Residential Building Energy	428,245	351,161	224,419	136,957
Natural Gas	*241,176*	*184,498*	*165,594*	*136,957*
Electricity	*187,070*	*166,663*	*58,825*	-
Commercial and Institutional Building Energy	300,818	265,168	141,958	61,312
Natural Gas	*109,593*	*81,780*	*74,452*	*61,312*
Electricity	*191,225*	*183,389*	*67,506*	-
Manufacturing Industries and Construction Energy	399,089	374,706	172,019	49,640
Natural Gas	*74,853*	*62,109*	*56,662*	*49,640*
Electricity	*324,235*	*312,597*	*115,358*	-
Energy Industries	219,899	238,067	251,006	264,648
Fugitive Emissions from Natural Gas	29,240	31,656	33,376	35,190
Transportation	**1,546,326**	**1,679,918**	**1,675,852**	**1,698,778**
Transportation % of Total	**50%**	**54%**	**62%**	**70%**
On-Road Transportation	1,213,601	1,089,895	1,056,457	1,077,775
Railways	11,883	13,515	14,127	15,472
Aviation	4,550	7,110	7,110	7,110
Maritime	301,345	553,770	582,209	582,209
Off-Road Equipment	14,947	15,627	15,948	16,212
Waste	**176,850**	**184,887**	**188,715**	**191,768**
Waste % of Total	**6%**	**6%**	**7%**	**8%**
Solid Waste Methane Commitment	173,164	181,043	184,768	187,820
Solid Waste Incineration	95	99	101	103
Wastewater Treatment and Discharge	3,592	3,744	3,845	3,845
TOTAL	**3,100,468**	**3,125,564**	**2,687,345**	**2,438,293**
Per Capita	6.6	6.5	5.5	5.0

Greenhouse Gas Target Setting

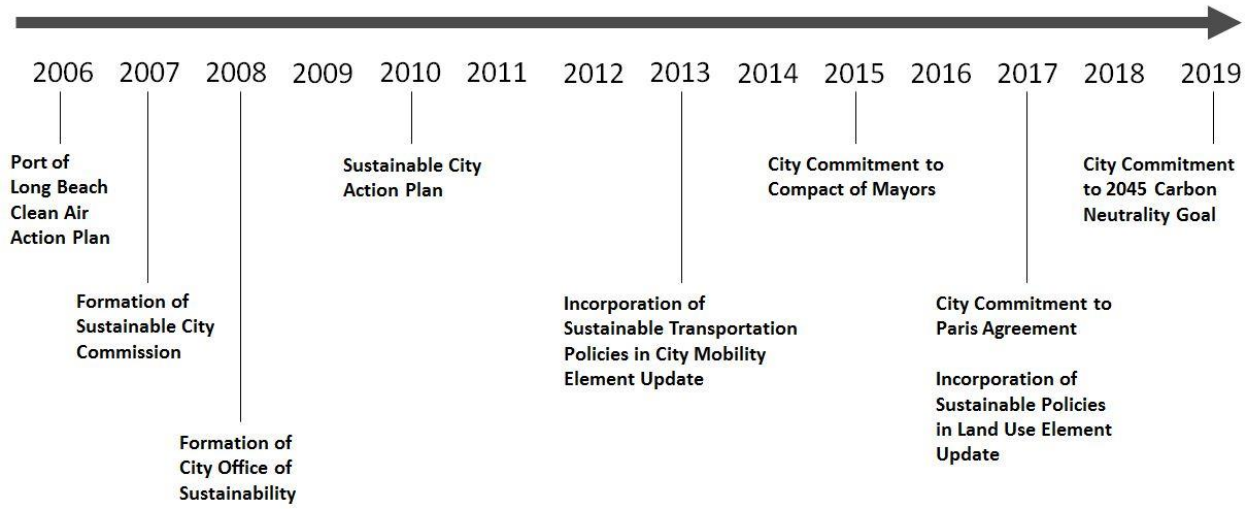
Greenhouse gas reduction targets serve as aspirational metrics to help focus local actions, such as for the purposes of this CAAP. Establishing clear and attainable targets can also motivate community members and City staff, help guide long-term strategies, and increase transparency and accountability regarding the CAAP's objectives. Establishing local GHG targets in Long Beach can also help to achieve the following objectives:

- Provide a goal post against which to evaluate the cumulative progress of the City's GHG reduction actions over time,
- Comply with requirements of the Global Covenant of Mayors, to which the City of Long of Beach has been a signatory since 2015,
- Demonstrate the City's commitment to global efforts on climate change,
- Illustrate the relationship between the City's reduction target and the State's own reduction goals for compliance with state mandates for cities related to greenhouse gas reduction, and
- Demonstrate a level of GHG emissions below which the City would have less than cumulatively considerable GHG impacts for future environmental review projects.

The City is already a leader in environmental sustainability and climate initiatives. Figure 7 illustrates a timeline with several examples of the City's sustainability-related activities, including the following recent examples related to GHG commitments:

- In 2015, Mayor Robert Garcia signed the Compact of Mayors (now the Global Covenant of Mayors) to join the world's largest coalition of city governments to address climate change.
- In 2017, Mayor Garcia joined 406 mayors across the United States in pledging to continue the goals of the Paris Climate Agreement to make sustainable changes to limit global temperature rise to well below 2°C.
- In 2019, Mayor Garcia encouraged the City to achieve a carbon neutrality goal by 2045, consistent with state Executive Order B-55-18

Figure 7 – Timeline of Long Beach Sustainability Activities



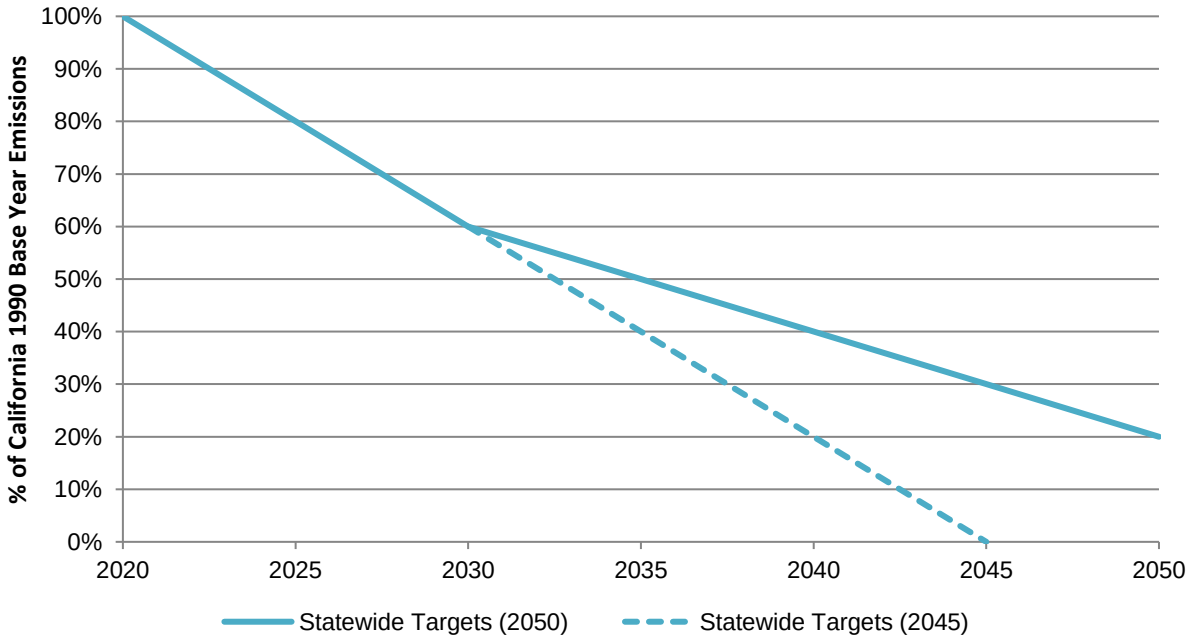
The CAAP is intended to chart a pathway to help the City fulfill these commitments. To that end, the City evaluated a series of GHG target options during plan development (see Appendix X Target Options Memo). Several reduction target options were considered and were vetted by the CAAP Scientific Working Group, a group of 13 independent experts including from California State University Long Beach, Long Beach Community College, University of California Los Angeles, the Aquarium of the Pacific, and the South Coast Air Quality Management District. The targets selected represent the City's commitment to doing its fair share and meeting its requirements to help California achieve its ambitious statewide GHG targets. Table 6 outlines the State's GHG reduction commitments. Near-term targets for 2020 and 2030 have been formally adopted by the state legislature. Executive Orders from previous Governors outline the state's potential long-term targets for 2045 and 2050, though neither of these represents an official state policy yet.

Table 6 – State of California Greenhouse Gas Targets

Target Year	Target	Corresponding Legislation
2020	Return to 1990 GHG levels by 2020	Assembly Bill 32, the California Global Warming Solutions Act of 2006
2030	40% below 1990 levels by 2030	Senate Bill 32, the Global Warming Solutions Act of 2006
2045	Carbon neutrality by 2045	Executive Order B-55-18 of 2018
2050	80% below 1990 levels by 2050	Executive Order S-3-05 of 2005

Figure 8 illustrates the trajectory of California's GHG target setting framework. The solid line shows an emissions trajectory for the previous 2050 executive order, while the dashed line shows a trajectory for the more recent 2045 executive order.

Figure 8 – Statewide Emissions Target Trajectory



City of Long Beach GHG Targets

2030

The City's near-term 2030 target was selected based on guidance provided in CARB's 2017 California Climate Change Scoping Plan, and was developed to demonstrate consistency with the statewide 2030 target shown in Figure 8. The City's 2030 target is established on a per capita emissions basis, and aims to achieve emissions rates of 4.46 MT CO_2e/capita, or stated another way, 3.06 MT/service population. This compares to the city's 2030 business-as-usual forecast of 6.5 MT CO_2e/capita. Based on the City's population growth estimates, the 2030 target emissions level is 2.1 million MT CO_2e/yr, and will require GHG reductions of approximately 980,000 MT CO_2e to achieve this target, or a reduction of approximately 2 metric tons per resident.

2045

The City also used the CAAP to begin initial evaluation of a long-term aspirational GHG reduction goal and has begun considering the strategies that will be required to achieve it. The City has set an aspirational goal to achieve net carbon neutrality citywide by 2045, which is consistent with the state's Executive Order B-55-18 that calls for statewide net carbon neutrality in the same year. With no CAAP, under the business-as-usual emissions forecast scenario the City's 2045 emissions are estimated to be approximately 2.6 million MT CO_2e. Achieving a net carbon neutrality target would require eliminating nearly all of these emissions, and purchasing carbon offsets for the remainder that cannot be reduced with future technologies. Table 7 summarizes the City's 2030 GHG target and its 2045 aspirational goal.

Table 7 – City of Long Beach GHG Reduction Targets

2030 GHG Target	**4.46 MT CO_2e/capita**
Emissions Forecast	3,125,564 MT CO_2e
Emissions Target Level	2,142,691 MT CO_2e
GHG Reductions Needed	**982,873 MT CO_2e**
2045 GHG Aspirational Goal	**Net-carbon Neutrality**
Emissions Forecast	2,562,819 MT CO_2e
Emissions Target Level	0 MT CO_2e MT CO_2e
GHG Reductions Needed	**2,562,819 MT CO_2e**

Figure 9 illustrates the City's emissions forecasts and reduction targets. The gap between the emissions forecast (purple line) and the target (blue line) show the amount of reductions needed in each year. The CAAP actions included in this plan will help the City achieve its near-term 2030 target, and begin on its path toward the 2045 goal.

Figure 9: Emissions Targets vs. Forecasts 2015-2050